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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/506,204	02/17/00	DOAN	T 3025.1US (95

EXAMINER	

MMC2/0406

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ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 04/06/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/506,204	DOAN, TRUNG T.	
	Examiner	Art Unit	
	Tuan Quach	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *January 29, 2001* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15)☐ Notice of References Cited (PTO-892)
16)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
17)☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
18)☐ Interview Summary (PTO-413) Paper No(s). _____ .
19)☐ Notice of Informal Patent Application (PTO-152)
20)☐ Other: .

DETAILED ACTION

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dixit et al. or Saran et al. taken with Kobayashi et al.

Either Dixit et al. (IEDM 94) or Saran et al. show the aluminum contact in contact holes in an insulating layer. See Dixit et al. Fig. 1, page 105, right column, page 106, Saran et al., Figs. 1B and 2B, column 2 line 2 to column 3 line 20. Note that for product by process claim, it is the patentability of the product claims which must be determined. Thus either Dixit et al. or Saran et al. thus lack the recitation of the advantages of inclusion of alloy, the recitation of homogeneous alloy, and and the various alloying element.

Kobayashi et al. teach the use of electrode containing Al as the primary component and the inclusion of additional component wherein the formation of homogeneous Al alloy, e.g., Cu, Mg, Zn, Ag, Ni, is also taught. The advantage of improved heat resistance and of the prevention of metal diffusion into the semiconductor material is also taught. See column 1 line 10 to column 3 line 42, column 4 lines 31-63.

It would have been obvious to one skilled in the art at the time the invention was made in practicing the Dixit et al. invention to have included the aluminum material having a desired alloy as taught by Koyayashi et al. wherein homogeneous aluminum alloys can be obtained. Any alternative alloy materials not recited otherwise would have

been obvious or alternatively, official notice is taken regarding such use to obtain the desired alloy having improved heat resistance and reduced diffusion given the teachings of the references as delineated.

Regarding the recitation concerning "void-free" feature in the preamble of claim 1 line 1 or in claim 23 last line claim 39 last line, to the extent such recitation could be argued to impart any patentability to the claims, such would have been met or otherwise obvious, absent evidence to the contrary, as shown in Dixit et al. wherein the filling does not require any void and thus would appear to be void-free as evidenced in Fig. 1 and the description in Dixit et al., page 105, right column wherein complete filling is obtained by high pressure, page 106 first paragraph wherein complete filling was achieved; and as shown in Saran et al., Figs. 1B and 2B, column 2 line 2 to column 3 line 20.

Applicant's arguments filed January 29, 2001 have been fully considered but they are not persuasive.

Applicant argues that Dixit et al. teach aluminum hole filling achieved by conventional of Al-Cu alloy to bridge the top of each metal, leaving a void inside the hole, and the wafer is then transferred in a high vacuum chamber with radiant heater and the bridged Al-Cu is forced into the holes by pressuring the chamber with argon and that in the instant independent claims 1, 23, and 39, the product was created by depositing an aluminum material on an exposed surface of the insulating layer, heating the aluminum material to partially fill the holes, applying pressure to the aluminum material to fill the holes, depositing a different material over the contact holes, and forming a homogeneous metal fill. Nonetheless, the void in Dixit does not exist in the

final product since a complete hole filling is achieved therein (see, e.g., the portion in Dixit et al. and Saran et al. delineated above), consistent with applicant's argument that the present invention results in complete filling of the hole or via. Thus contrary to applicant's argument the evidence of record does not support that Dixit et al. or Saran et al. would have a void in the product. As delineated above, the claimed invention ultmately corresponds to product claims and it is the patentability of the product which must be determined as as evidenced by Dixit et al. or Saran et al, the product do not show or require void and applicant has failed to show such void would result in the products therein.

Applicant argues that the application eliminates the need for a TiN barrier film. Applicant has not pointed out any evidence to support this allegation or that the inventions in Dixit et al. and Saran et al. would not operate or could not be practiced without such barrier. The claims further do not preclude the TiN barrier.

Applicant argues that there is no motivation in Kobayashi to combine with Dixit et al. or Saran et al. Nonetheless, this does not take into consideration the teachings of Kobayashi evidences that the employment of metal electrode in semiconductor device wherein diffusion of metal element into the semiconductor can be obviated thereby preventing property degradation and improving yield and lifetime of the products.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Quach whose telephone number is (703) 308-1096. The examiner can normally be reached on Monday through Friday from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Tuan Quach
Primary Examiner